

## ECOSYSTEM STATUS INDICATORS

### *Salmon*

#### **Western Alaska juvenile salmon ecology along the eastern Bering Sea shelf.**

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Data from annual BASIS (Bering-Aleutian Salmon International Survey) surveys are being used to address how changing ocean conditions impact the distribution, growth, and survival of North Pacific salmon. The BASIS research program is an international effort among members of the North Pacific Anadromous Fish Commission (Canada, Japan, Republic of South Korea, Russia, and United States). The U.S. BASIS surveys have occurred along the eastern Bering Sea shelf during August–September of 2000–2001 and during August–October of 2002–2004, and have gathered information on the distribution, growth, and condition of western Alaska salmon and on the pelagic ecosystem of the eastern Bering Sea shelf. Physical and biological data including information on frontal boundaries, water column structure, nutrients, phytoplankton, and zooplankton populations are also collected during the surveys.

Results indicate that there are geographical differences in distribution and migration pathways of western Alaska juvenile salmon during this time period (Figure 62). Yukon River salmon stocks are distributed along the western Alaska coast from the Yukon River to latitude 60°N. Kuskokwim River salmon stocks are generally distributed south of latitude 60°N from the Kuskokwim River to longitude 175°W. Bristol Bay stocks are generally distributed within the middle domain between the Alaska Peninsula and latitude 60°N and from Bristol Bay to longitude 175°W. The seaward migration from natal freshwater river systems is south and east away from the Yukon River for Yukon River chum salmon, to the east and south away from the Kuskokwim River for Kuskokwim River chum, chinook, and coho salmon, and east away from Bristol Bay river systems for Bristol Bay sockeye salmon stocks. The size and relative abundance of juvenile Bristol Bay sockeye salmon was lowest during 2001 and highest during 2002 and 2003 (Figures 63 and 64). Relative survival of juvenile Bristol Bay sockeye salmon was lowest during 2001 and highest during 2002 (Table 11). It is hypothesized that survival of western Alaska sockeye salmon is linked to their early marine growth and that their growth is related to ocean conditions that influence the offshore distribution of juvenile salmon into areas of higher forage opportunities.

Table 11. The number of returning adult sockeye salmon, average brood year escapements (BYESC), and estimated relative survival for early marine growth years (EMG Yr) 2000 – 2002.

EMG Year	Brood Years	Avg. BYESC (Millions)	Return Years	Returns (Millions)	Relative Survival
2000	1997/1998	7.1	2002/2003	27.1	3.8
2001	1998/1999	10.9	2003/2004	20.4	1.88
2002	1999/2000	10.6	2004/2005	56.6*	5.33

\*The 3-ocean sockeye salmon return for 2005 is based on the estimate of the 3-ocean returns from the 2005 Alaska Department of Fish and Game Bristol, Bay sockeye salmon forecast.

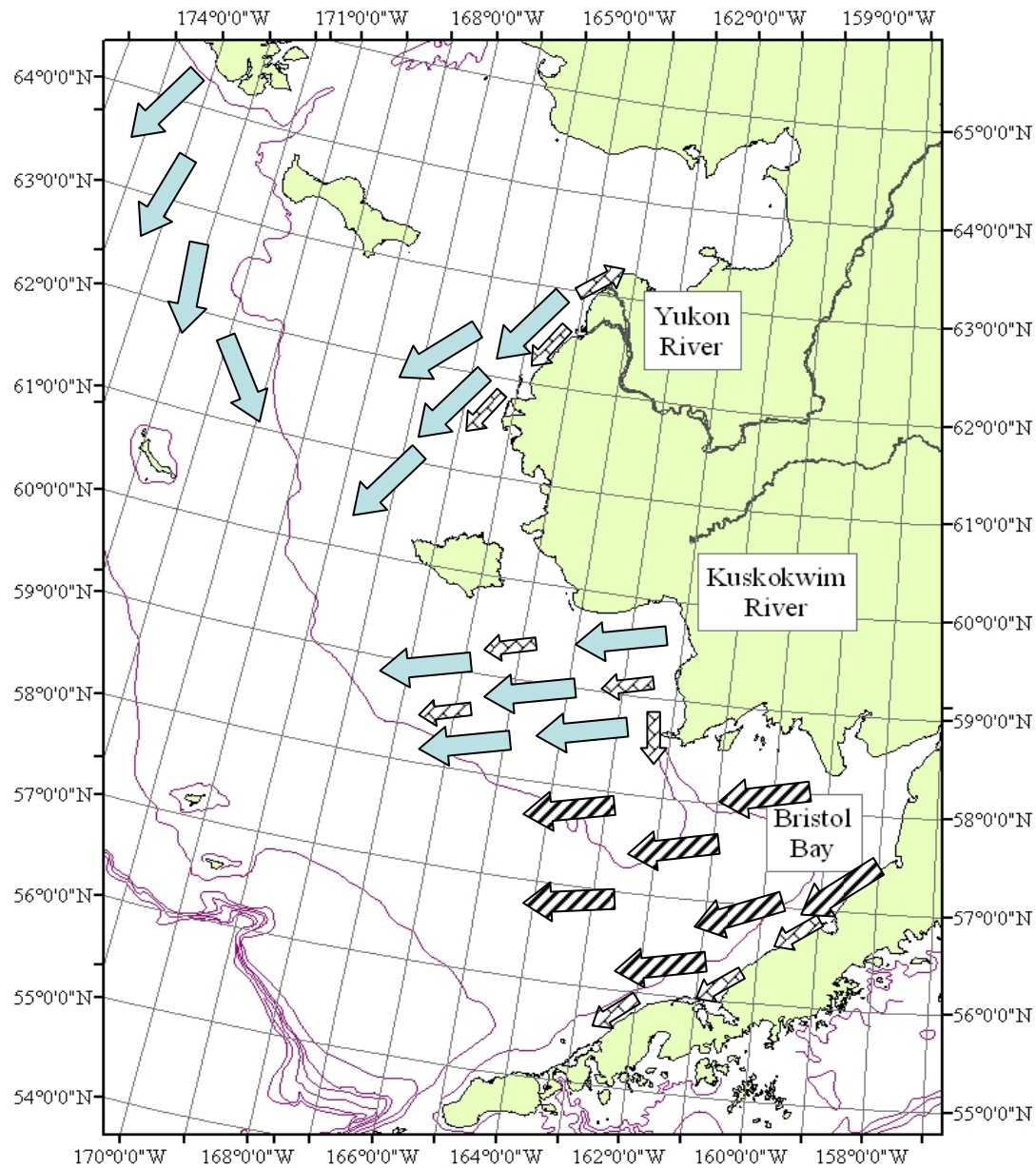


Figure 62. Seaward migration pathways for juvenile chum (solid arrow), sockeye (slashed line arrow), coho, and chinook (boxed line arrow) salmon along the eastern Bering Sea shelf, August through October.

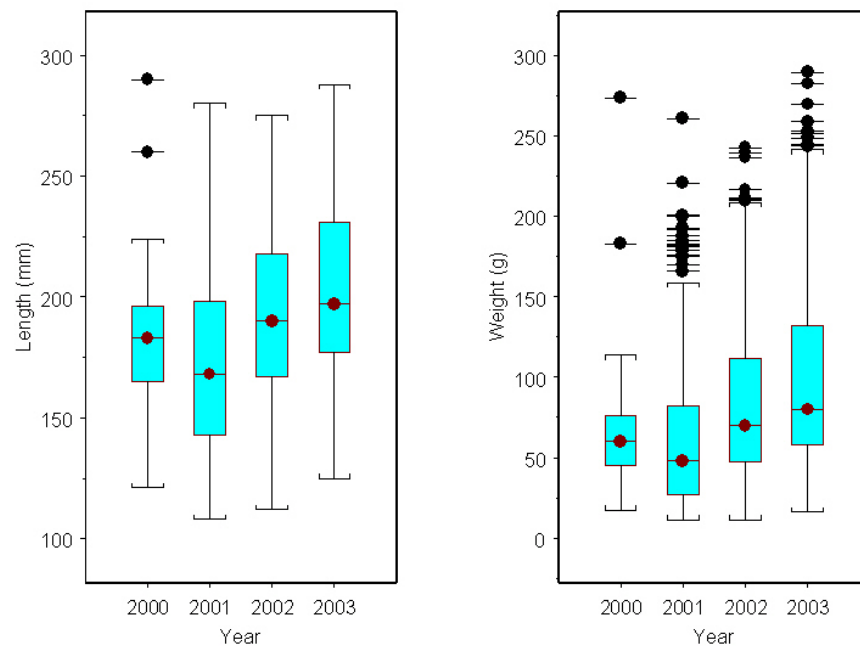


Figure 63. Box plots of juvenile Bristol Bay sockeye salmon fork length (mm) and weight (g) collected along the eastern Bering Sea shelf, August–September of 2000–2003.

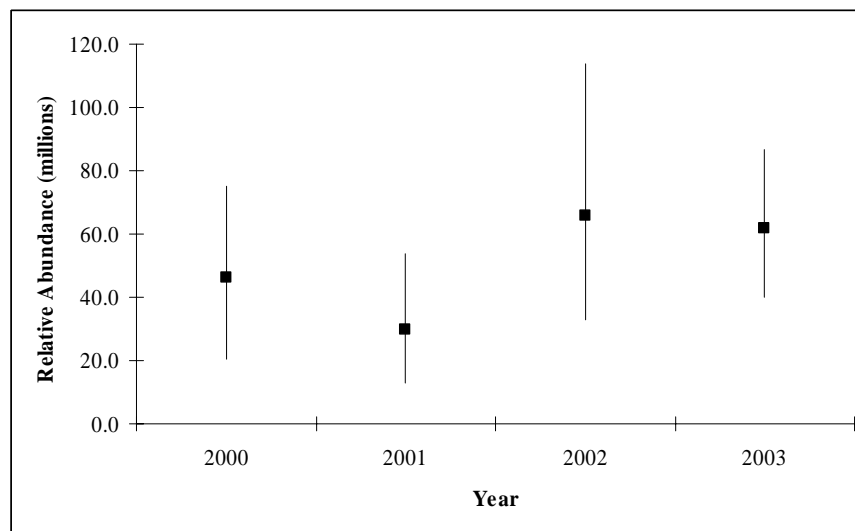


Figure 64. Relative abundance (millions) and 95% confidence intervals of juvenile Bristol Bay sockeye salmon collected along the eastern Bering Sea shelf, August–September of 2000–2003.